UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/796,978	03/11/2004	Takaaki Kawahara	403001	4044

23548 7590 10/18/2005

LEYDIG VOIT & MAYER, LTD
700 THIRTEENTH ST. NW
SUITE 300
WASHINGTON, DC 20005-3960

EXAMINER	
LEE, CHEUNG	

ART UNIT	PAPER NUMBER
2812	

DATE MAILED: 10/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/796,978	KAWAHARA ET AL.	
	Examiner	Art Unit	
	Cheung Lee	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *11 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/11/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Notice to Applicant

1. Applicant's Preliminary Amendment filed on March 11, 2004 has been entered and made of record.

Information Disclosure Statement

2. The information disclosure statements (IDS) submitted on March 11, 2004 was filed before the first action on the merits. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Specification

3. The disclosure is objected to because of the following informalities: on page 4, line 16, "ETO" needs to be corrected to EOT.

Claim Objections

4. Claims 9-12 are objected to because of the following informalities: in lines 17-24, both purging steps refer to "film-forming material" or "film-forming materials". It appears that one step should refer to the oxidants purging.

Claims 10-12 depend from claim 9, so they are objected for the same reason.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 17-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 17, lines 18-22, the language is narrative and indefinite. It appears to be a literal translation into English from a foreign document and is replete with grammatical and idiomatic errors.

Claims 18-20 depend from claim 17, so they are rejected for the same reason.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahn et al. (US Pub 2004/0175882; hereinafter "Ahn") in view of Chang et al. (US Pat 6884719; hereinafter "Chang").

7. With respect to claims 1, 5, and 9, referring to figures 4-5, Ahn discloses a method for manufacturing a semiconductor device comprising: forming a first insulating film on a substrate, in the case where no cleaning process is performed, the native silicon oxide layer will be present on the substrate (see page 6, paragraph 62); forming a second insulating film on the first insulating (step 430); and forming a gate electrode

(step 550) on the second insulating film, wherein forming a second insulating film comprises supplying film-forming materials and adsorbing the film-forming materials on the first insulating film (page 3, paragraphs 37-38); purging the film-forming materials that have not been adsorbed (step 435); supplying oxidants to oxidize the adsorbed film-forming materials (step 440); and purging the oxidants that have not contributed to oxidization (step 445); forming the second insulating film repeatedly, for a plurality of cycles, continuously (step 450). Ahn also discloses a predetermined number of cycles to form the second insulating film (page 7, paragraph 74), the predetermined number of cycles comprises an initial number of cycles, but Ahn does not disclose expressly that in the initial number of cycles the oxidant purging time is longer than that of cycles after the initial number of cycles; and the film-forming materials purging time in the initial number of cycles is longer than that of the cycles after the initial number of cycles.

Chang discloses deposition conditions or parameters to form a dielectric layer may be controlled. One reaction cycle operates at one set of reaction conditions, while another reaction cycle operates at another set of deposition conditions (col. 9, line 66-col. 10, line 14).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a longer purging time for film-forming materials and oxidants during the initial cycles. The motivation for doing so would have been to obtain high interface quality reducing contaminations and unwanted dangling bonds which cause leakage current (Chang; col. 10, lines 53-64).

8. With respect to claim 13, Ahn in view of Chang discloses substantially the limitations of claim 13, as shown above. Chang also discloses supplying a larger quantity of the oxidants in an initial number of cycles than in the cycles after the initial number of cycles (col. 10, lines 45-52).

9. With respect to claim 17, Ahn in view of Chang discloses substantially the limitations of claim 17, as shown above. Chang discloses deposition conditions or parameters to form a dielectric layer may be controlled. One reaction cycle operates at one set of reaction conditions, while another reaction cycle operates at another set of deposition conditions (col. 9, line 66-col. 10, line 14).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to supply oxidants in separated times. Since Chang discloses supplying a larger quantity of the oxidants in an initial number of cycles than in the cycles after the initial number of cycles, it is obvious that the number of the separated times of supplying the oxidants in the initial number of cycles is larger than that of cycles after the initial number of cycles. The motivation for doing so would have been to obtain high interface quality reducing contaminations and unwanted dangling bonds which cause leakage current (Chang; col. 10, lines 53-64), and to make sure the film-forming material is adequately oxidized.

10. With respect to claims 2, 6, and 10, Ahn in view of Chang does not disclose expressly wherein the purging time of the oxidants in the initial number of cycles is 5 to 15 times longer than the purging time of the oxidants in the cycles after the initial number of cycles; and the purging time of the film-forming materials in the initial number

of cycles is 5 to 10 times longer than the purging time of the film-forming materials in the cycles after the initial number of cycles. However, any variation in purging time of the oxidants and the film-forming materials in the present claim is obvious in light of the cited art, because the changes in purging time of the oxidants and the film-forming materials produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the part. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. *In re Aller, Lacey and Hall*, 105 USPQ 233, 235. *In re Reese* 129 USPQ 402, 406.

11. With respect to claims 3, 7, 11, 15, and 19, Ahn in view of Chang discloses the second insulating film is selected from the group consisting of HfO_2, $HfAlO_x$, $HfSiO_x$, and nitrides thereof (Ahn, page 6, paragraphs 61 and 74; Chang, col. 10, lines 53-64).

12. With respect to claims 4, 8, 12, 16 and 20, Ahn in view of Chang does not disclose expressly wherein the initial number of cycles is 10 to 20 cycles (5 to 20 cycles in claims 16 and 20). Ahn discloses a predetermined number of cycles to form the second insulating film (page 7, paragraph 74), the predetermined number of cycles comprises an initial number of cycles. Any variation in initial number of cycles in the present claim is obvious in light of the cited art, because the changes in initial number of cycles produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the part. Patentability over the prior art will only occur if the parameter variation produces an unexpected

result. *In re Aller, Lacey and Hall*, 105 USPQ 233, 235. *In re Reese* 129 USPQ 402, 406.

13. With respect to claims 14 and 18, Ahn in view of Chang does not disclose expressly wherein [Claim 14] the quantity of the oxidants supplied in the initial number of cycles is 2 to 3 times larger than that of the cycles after the initial number of cycles; [Claim 18] the number of the separated times of supplying the oxidants in the initial number cycle is 2 to 3 times larger than that of the cycles after the initial number cycles. However, any variation in quantity of the oxidants in the present claim is obvious in light of the cited art, because the changes in quantity of the oxidants produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the part. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. *In re Aller, Lacey and Hall*, 105 USPQ 233, 235. *In re Reese* 129 USPQ 402, 406.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cheung Lee whose telephone number is 571-272-5977. The examiner can normally be reached on Monday through Friday from 8:30AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Cheung Lee

October 13, 2005

HA NGUYEN
PRIMARY EXAMINER